

In the Claims

For the Examiner's convenience, all of the pending claims are listed as follows.

1. (Previously Presented) An ink-jet recording process for conducting recording by ejecting a pigment ink and a reaction liquid containing a polyvalent metal salt from a recording section, in which a plurality of nozzles for ejecting the pigment ink and the reaction liquid are arranged, to a recording medium while relatively scanning the recording section to the recording medium, the process comprising the steps of:

ejecting the pigment ink having a surface tension lower than that of the reaction liquid to the reaction liquid ejected on the surface of the recording medium; and

forming a filmy aggregate by gathering of agglomerates at an interface where the reaction liquid has come into contact with the pigment ink,

wherein conditions for ejecting the reaction liquid in said ejecting step satisfy the relationship of

$$55 \times \frac{0.85 \times 10^6 \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)} \leq duty(\%) \leq 125 \times \frac{0.85 \times 10^6 \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)}$$

wherein $Vd(pl)$ is an ejection volume per dot of the reaction liquid, $Rx(dpi)$ is a recording resolution in the direction of the relative scanning, $Ry(dpi)$ is a recording resolution in the arrangement direction of the nozzles, and $duty(\%)$ is a recording duty of the reaction liquid.

2. (Previously Presented) An ink-jet recording process for conducting recording by ejecting a pigment ink and a reaction liquid containing a polyvalent metal salt from a recording section, in which a plurality of nozzles for ejecting the pigment ink and the reaction liquid are arranged, to a recording medium while relatively scanning the recording section to the recording medium, the process comprising the steps of:

ejecting the pigment ink having a surface tension lower than that of the reaction liquid to the reaction liquid ejected on the surface of the recording medium; and

forming a filmy aggregate by gathering of agglomerates at an interface where the reaction liquid has come into contact with the pigment ink,

wherein conditions for ejecting the reaction liquid to a prescribed area on the recording medium when at least the recording duty of the ink in the prescribed area is 100% satisfy the relationship of

$$55 \times \frac{0.85 \times 10^{-6} \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)} \leq duty(\%) \leq 125 \times \frac{0.85 \times 10^{-6} \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)}$$

wherein $Vd(pl)$ is an ejection volume per dot of the reaction liquid, $Rx(dpi)$ is a recording resolution in the direction of the relative scanning, $Ry(dpi)$ is a recording resolution in the arrangement direction of the nozzles, and $duty(\%)$ is a recording duty of the reaction liquid.

3. (Previously Presented) An ink-jet recording process for conducting recording on a recording medium by ejecting a pigment ink and a reaction liquid having a surface tension higher than that of the pigment ink and containing a polyvalent metal salt, which agglomerates the pigment ink, from a recording section, in which a plurality of nozzles for ejecting the pigment ink and the reaction liquid are arranged, to the recording medium while relatively scanning the recording section to the recording medium, the process comprising the steps of:

ejecting the reaction liquid to the recording medium; and

ejecting the pigment ink to the recording medium in such a manner that the pigment ink is brought into contact with the reaction liquid present in a liquid state on the surface of the recording medium,

wherein conditions for ejecting the reaction liquid in the ejection step satisfy the relationship of

$$55 \times \frac{0.85 \times 10^6 \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)} \leq duty(\%) \leq 125 \times \frac{0.85 \times 10^6 \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)}$$

wherein $Vd(pl)$ is an ejection volume per dot of the reaction liquid, $Rx(dpi)$ is a recording resolution in the direction of the relative scanning, $Ry(dpi)$ is a recording resolution in the arrangement direction of the nozzles, and $duty(\%)$ is a recording duty of the reaction liquid.

4. (Previously Presented) An ink-jet recording process for conducting recording on a recording medium by ejecting a pigment ink and a reaction liquid having a surface tension higher than that of the pigment ink and containing a polyvalent metal salt, which agglomerates the pigment ink, from a recording section, in which a plurality of nozzles for ejecting the pigment ink and the reaction liquid are arranged, to the recording medium while relatively scanning the recording section to the recording medium, the process comprising the steps of:

ejecting the reaction liquid to the recording medium; and

ejecting the pigment ink to the recording medium in such a manner that the pigment ink is brought into contact with the reaction liquid present in a liquid state on the surface of the recording medium,

wherein conditions for ejecting the reaction liquid to a prescribed area on the recording medium when at least the recording duty of the ink in the prescribed area is 100% satisfy the relationship of

$$55 \times \frac{0.85 \times 10^{-6} \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)} \leq duty(\%) \leq 125 \times \frac{0.85 \times 10^{-6} \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)}$$

wherein $Vd(pl)$ is an ejection volume per dot of the reaction liquid, $Rx(dpi)$ is a recording resolution in the direction of the relative scanning, $Ry(dpi)$ is a recording resolution in the arrangement direction of the nozzles, and $duty(\%)$ is a recording duty of the reaction liquid.

5. (Previously Presented) An ink-jet recording process for conducting recording by ejecting a reaction liquid containing a polyvalent metal salt and a surfactant and a pigment ink containing a surfactant in a higher content than that of the reaction liquid to a recording medium from a recording section, in which a plurality of nozzles for ejecting the reaction liquid and the pigment ink are arranged, while relatively scanning the recording section to the recording medium, the process comprising the steps of:

bringing the pigment ink into contact with the reaction liquid present on the surface of the recording medium; and

forming a filmy aggregate by gathering of agglomerates at the interface where the reaction liquid has come into contact with the pigment ink,

wherein conditions for ejecting the reaction liquid satisfy the relationship of

$$55 \times \frac{0.85 \times 10^4 \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)} \leq duty(\%) \leq 125 \times \frac{0.85 \times 10^6 \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)}$$

wherein $Vd(pl)$ is an ejection volume per dot of the reaction liquid, $Rx(dpi)$ is a recording resolution in the direction of the relative scanning, $Ry(dpi)$ is a recording resolution in the arrangement direction of the nozzles, and $duty(\%)$ is a recording duty of the reaction liquid.

6. (Previously Presented) An ink-jet recording process for conducting recording by ejecting a reaction liquid containing a polyvalent metal salt and a surfactant and a pigment ink containing a surfactant in a higher content than that of the reaction liquid to a recording medium from a recording section, in which a plurality of nozzles for ejecting the reaction liquid and the pigment ink are arranged, while relatively scanning the recording section to the recording medium, the process comprising the steps of:

bringing the pigment ink into contact with the reaction liquid present on the surface of the recording medium; and

forming a filmy aggregate by gathering of agglomerates at the interface where the reaction liquid has come into contact with the pigment ink,

wherein conditions for ejecting the reaction liquid to a prescribed area on the recording medium when at least the recording duty of the ink in the prescribed area is 100% satisfy the relationship of

$$55 \times \frac{0.85 \times 10^6 \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)} \leq duty(\%) \leq 125 \times \frac{0.85 \times 10^6 \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)}$$

wherein $Vd(pl)$ is an ejection volume per dot of the reaction liquid, $Rx(dpi)$ is a recording resolution in the direction of the relative scanning, $Ry(dpi)$ is a recording resolution in the arrangement direction of the nozzles, and $duty(\%)$ is a recording duty of the reaction liquid.

7. (Previously Presented) An ink-jet recording process for conducting recording by ejecting a reaction liquid containing a polyvalent metal salt and a pigment ink having a surface tension lower than that of the reaction liquid to a recording medium in that order from a recording section, in which a plurality of nozzles for ejecting the reaction liquid and the pigment ink are arranged, while relatively scanning the recording section to the recording medium, the process comprising the steps of:

bringing the reaction liquid into contact with the pigment ink on the surface of the recording medium;

forming a filmy aggregate by gathering of agglomerates at an interface where the reaction liquid has come into contact with the pigment ink; and

accelerating penetration of the reaction liquid with respect to the recording medium,

wherein conditions for ejecting the reaction liquid satisfy the relationship of

$$55 \times \frac{0.85 \times 10^6 \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)} \leq duty(\%) \leq 125 \times \frac{0.85 \times 10^6 \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)}$$

wherein $Vd(pl)$ is an ejection volume per dot of the reaction liquid, $Rx(dpi)$ is a recording resolution in the direction of the relative scanning, $Ry(dpi)$ is a recording resolution in the arrangement direction of the nozzles, and $duty(\%)$ is a recording duty of the reaction liquid.

8. (Previously Presented) An ink-jet recording process for conducting recording by ejecting a reaction liquid containing a polyvalent metal salt and a pigment ink having a surface tension lower than that of the reaction liquid to a recording medium in that order from a recording section, in which a plurality of nozzles for ejecting the reaction liquid and the pigment ink are arranged, while relatively scanning the recording section to the recording medium, the process comprising the steps of:

bringing the reaction liquid into contact with the pigment ink on the surface of the recording medium;

forming a filmy aggregate by gathering of agglomerates at an interface where the reaction liquid has come into contact with the pigment ink; and

accelerating penetration of the reaction liquid with respect to the recording medium,

wherein conditions for ejecting the reaction liquid to a prescribed area on the recording medium when at least the recording duty of the ink in the prescribed area is 100% satisfy the relationship of

$$55 \times \frac{0.85 \times 10^{-6} \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)} \leq duty(\%) \leq 125 \times \frac{0.85 \times 10^{-6} \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)}$$

wherein $Vd(pl)$ is an ejection volume per dot of the reaction liquid, $Rx(dpi)$ is a recording resolution in the direction of the relative scanning, $Ry(dpi)$ is a recording resolution in the arrangement direction of the nozzles, and $duty(\%)$ is a recording duty of the reaction liquid.

9. (Previously Presented) An ink-jet recording process for conducting recording on a recording medium by ejecting a pigment ink containing a surfactant and a reaction liquid containing a polyvalent metal salt, which agglomerates the pigment ink, from a recording section, in which a plurality of nozzles for ejecting the pigment ink and the reaction liquid are arranged, to the recording medium while relatively scanning the recording section to the recording medium, the process comprising the steps of:

ejecting the reaction liquid to the recording medium; and

ejecting the pigment ink to the recording medium in such a manner that the pigment ink is brought into contact with the reaction liquid present in a liquid state on the surface of the recording medium,

wherein the pigment ink contains the surfactant in a higher content than that in the reaction liquid, and

wherein conditions for ejecting the reaction liquid in the ejection step satisfy the relationship of

$$55 \times \frac{0.85 \times 10^{-6} \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)} \leq duty(\%) \leq 125 \times \frac{0.85 \times 10^{-6} \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)}$$

wherein $Vd(pl)$ is an ejection volume per dot of the reaction liquid, $Rx(dpi)$ is a recording resolution in the direction of the relative scanning, $Ry(dpi)$ is a recording resolution in the arrangement direction of the nozzles, and $duty(\%)$ is a recording duty of the reaction liquid.

10. (Previously Presented) An ink-jet recording process for conducting recording on a recording medium by ejecting a pigment ink containing a surfactant and a reaction liquid containing a polyvalent metal salt, which agglomerates the pigment ink, from a recording section, in which a plurality of nozzles for ejecting the pigment ink and the reaction liquid are arranged, to the recording medium while relatively scanning the recording section to the recording medium, the process comprising the steps of:

ejecting the reaction liquid to the recording medium; and

ejecting the pigment ink to the recording medium in such a manner that the pigment ink is brought into contact with the reaction liquid present in a liquid state on the surface of the recording medium,

wherein the pigment ink contains the surfactant in a higher content than that in the reaction liquid, and

wherein conditions for ejecting the reaction liquid to a prescribed area on the recording medium when at least the recording duty of the ink in the prescribed area is 100% satisfy the relationship of

$$55 \times \frac{0.85 \times 10^{-6} \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)} \leq duty(\%) \leq 125 \times \frac{0.85 \times 10^{-6} \times Vd(pl)^{-0.61}}{Rx(dpi)Ry(dpi)}$$

wherein $Vd(pl)$ is an ejection volume per dot of the reaction liquid, $Rx(dpi)$ is a recording resolution in the direction of the relative scanning, $Ry(dpi)$ is a recording resolution in the arrangement direction of the nozzles, and $duty(\%)$ is a recording duty of the reaction liquid.